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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/992,599	11/06/2001	Sanjay K. Yedur	D546	9923

7590 10/28/2003
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EXAMINER

LE, JOHN H

ART UNIT PAPER NUMBER

2863

DATE MAILED: 10/28/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application N

09/992,599

Applicant(s)

YEDUR ET AL.

Examiner

John H Le

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-31 is/are pending in the application.
- 4a) Of the above claim(s) 10-14, 22-29 and 31 is/are withdrawn from consideration.
- 5) ☒ Claim(s) 15-21 is/are allowed.
- 6) ☒ Claim(s) 1-3, 5, 7 and 30 is/are rejected.
- 7) ☒ Claim(s) 4, 6, 8 and 9 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 06 November 2001 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). ____
- 2) ☒ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) ____ 6) ☐ Other: ____

DETAILED ACTION

Election/Restrictions

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:
 - I. Claims 1-9, 15-21, 30, drawn to an apparatus and method for aligning layer, classified in class 702, subclass 93.
 - II. Claims 10-14, 31, drawn to a fabrication method for a layered device, classified in class 250, subclass 548.
 - III. Claims 22-29, drawn to a layered device, classified in class 702, subclass 85.
2. The inventions are distinct, each from the other because of the following reasons:

Inventions I and II are related as subcombinations disclosed as usable together in a single combination. The subcombinations are distinct from each other if they are shown to be separately usable. In the instant case, invention I has separate utility such as the apparatus and method for aligning layer of group I does not required steps of providing a substrate including a metrology feature; determining the topology of one or more layers formed on the substrate; forming a patterned layer on the one or more layers formed on the substrate; determining whether the patterned layer is within one or more tolerances, the one or more tolerances being determined in accordance with the topology of the one or more layers; and selecting the next processing step in accordance with whether the patterned layer is within the one or more tolerances of group II and the fabrication method for a layered device of group II does not required steps of detecting a topology of at least one layer; determining an apparent location of a

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metrology mark; adjusting the apparent location of the metrology mark to determine an adjusted location of the metrology mark; and aligning another layer according to the adjusted location of the metrology mark of group I. See MPEP § 806.05(d).

Inventions I and III are related as subcombinations disclosed as usable together in a single combination. The subcombinations are distinct from each other if they are shown to be separately usable. In the instant case, invention I has separate utility such as the apparatus and method for aligning layer of group I does not required a plurality of patterned layers; at least one of the plurality of patterned layers being planarized and having at least one topological metrology feature indicative of a position of a pattern of another of the plurality of patterned layers; and an aligned layer aligned with the pattern of the another of the plurality of patterned layers which includes an alignment adjustment to compensate for the at least one of the plurality of patterned layers being planarized of group III and the a layered device of group III does not required a detector for detecting a topology of at least one layer to determine an apparent location of a metrology mark, the apparent location of the metrology mark being offset from the actual position of the metrology mark by a distortion amount; and a mask which is aligned according to the apparent location and adjustment information, wherein the adjustment information is corresponds to the distortion amount of group I. See MPEP § 806.05(d).

Inventions II and III are related as subcombinations disclosed as usable together in a single combination. The subcombinations are distinct from each other if they are shown to be separately usable. In the instant case, invention II has separate utility such

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as the fabrication method for a layered device of group II does not required at least one of the plurality of patterned layers being planarized and having at least one topological metrology feature indicative of a position of a pattern of another of the plurality of patterned layers; and an aligned layer aligned with the pattern of the another of the plurality of patterned layers which includes an alignment adjustment to compensate for the at least one of the plurality of patterned layers being planarized of group III and the layered device of group III does not required steps of providing a substrate; determining the topology of one or more layers formed on the substrate; forming a patterned layer on the one or more layers formed on the substrate; determining whether the patterned layer is within one or more tolerances, the one or more tolerances being determined in accordance with the topology of the one or more layers; and selecting the next processing step in accordance with whether the patterned layer is within the one or more tolerances of group II. See MPEP § 806.05(d).

Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.

3. During a telephone conversation with Attorney Jonathan A. Platt on 09/29/2003 a provisional election was made with traverse to prosecute the invention of Group I, claims 1-9, 15-21, 30. Affirmation of this election must be made by applicant in replying to this Office action. Claims 10-14, 22-31 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Drawings

4. The drawings are objected to under 37 CFR 1.84 for the reasons set forth by the draftsman. See attached PTO-948 form for details. Correction is required.

Claim Rejections - 35 USC § 112

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Claim 30 is rejected as failing to define the invention in the manner required by 35 U.S.C. 112, second paragraph.

The claim(s) are narrative in form and replete with indefinite and functional or operational language. The structure which goes to make up the device must be clearly and positively specified. The structure must be organized and correlated in such a manner as to present a complete operative device. The claim(s) must be in one sentence form only. Note the format of the claims in the patent(s) cited.

For example:

Claim 30, line 1, "an article made according to the method of claim 1" is unclear.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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8. Claims 1-3, 5, and 30 rejected under 35 U.S.C. 103(a) as being unpatentable over Thomas (USP 5,317,141) in view of Lin (USP 5,929,997).

Regarding claims 1, 5, and 30, Thomas teaches an alignment method comprising: determining an apparent location of a metrology mark (e.g. Col.9, lines 11-23, lines 54-66); adjusting the apparent location of the metrology mark to determine an adjusted location of the metrology mark (e.g. Col.11, lines 13); and aligning another layer according to the adjusted location of the metrology mark (e.g. Col.18, line 45-Col.19, line 2).

Regarding claim 2, Thomas teaches atomic force microscopy is used in the changes in the mask topography (e.g. Col.9, lines 34-48).

Thomas fails to teach step of detecting a topology of at least one layer.

Lin teaches step of detecting a topology of at least one layer (e.g. Col.7, lines 60-67).

Regarding claim 3, Lin teaches determining the apparent location of the metrology mark is determined optically (e.g. Col.8, lines 50-68).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include step of detecting a topology of at least one layer as taught by Lin in an apparatus and method for high-accuracy alignment of Thomas for the purpose of providing a new wafer alignment technique by providing an optical system for detecting the alignment marks formed on the backside of the wafer and directing the reflecting beam from these marks to the alignment detector such that wafer alignment can be synchronously performed without being affected by surface topology

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changes made to the front surface of the wafer as results of various manufacturing processes performed thereon (Lin, Col.3, lines 39-47).

9. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Thomas (USP 5,317,141) in view of Lin (USP 5,929,997) as applied to claims 1 and 5 above, and further in view of Raeder et al. (USP 6,057,068).

Regarding claim 7, the combination of Thomas and Lin discussed supra, discloses the claimed invention except planarization is performed prior to determining the apparent location of the metrology mark.

Raeder et al. teach a device for measuring the planarization efficiency of a planarization process. The device includes a substrate 200 having a plurality of die 202 separated by horizontal and vertical scribe lines 204 and 206. The substrate 200 may further include alignment marks 205 readable by a metrology tool for aligning the tool with a desired location on the substrate 200 (Col.4, lines 15-22).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include planarization is performed prior to determining the apparent location of the metrology mark as taught by Raeder et al. in an apparatus and method for high-accuracy alignment of Thomas in view of Lin for the purpose of providing devices for use in measuring the planarization efficiency of a planarization process and methods and systems which perform the measurement using the device (Lin, Col.2, lines 19-22).

Allowable Subject Matter

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10. Claims 4, 6, 8, and 9 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

11. Claims 15-21 are allowed.

The following is a statement of reasons for the indication of allowable subject matter:

Regarding claim 4, none of the prior art of record teaches or suggests the combination of an alignment method, wherein the method comprising steps of detecting a topology of at least one layer; determining an apparent location of a metrology mark, wherein determining the apparent location of the metrology mark is determined optically; adjusting the apparent location of the metrology mark to determine an adjusted location of the metrology mark, wherein adjusting the apparent location of the metrology mark adjusts for optical horizontal shift; and aligning another layer according to the adjusted location of the metrology mark. It is these limitations as they are claimed in the combination, which have not been found, taught or suggested in the prior art of record, that make these claims allowable over the prior art.

Regarding claim 6, none of the prior art of record teaches or suggests the combination of an alignment method, wherein the method comprising steps of detecting a topology of at least one layer; determining an apparent location of a metrology mark, wherein determining the apparent location of the metrology mark is determined topologically; adjusting the apparent location of the metrology mark to determine an adjusted location of the metrology mark, wherein adjusting the apparent location of the

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metrology mark adjusts for topological horizontal shift; and aligning another layer according to the adjusted location of the metrology mark. It is these limitations as they are claimed in the combination, which have not been found, taught or suggested in the prior art of record, that make these claims allowable over the prior art.

Regarding claim 8, none of the prior art of record teaches or suggests the combination of an alignment method, wherein the method comprising steps of detecting a topology of at least one layer; determining an apparent location of a metrology mark; adjusting the apparent location of the metrology mark to determine an adjusted location of the metrology mark, wherein adjusting the apparent location of the metrology mark includes an adjustment for at least one predetermined factor; and aligning another layer according to the adjusted location of the metrology mark. It is these limitations as they are claimed in the combination, which have not been found, taught or suggested in the prior art of record, that make these claims allowable over the prior art.

Regarding claim 9, none of the prior art of record teaches or suggests the combination of an alignment method, wherein the method comprising steps of detecting a topology of at least one layer; determining an apparent location of a metrology mark; adjusting the apparent location of the metrology mark to determine an adjusted location of the metrology mark, wherein adjusting the apparent location of the metrology mark includes an adjustment for at least one nonpredetermined factor; and aligning another layer according to the adjusted location of the metrology mark. It is these limitations as they are claimed in the combination, which have not been found, taught or suggested in the prior art of record, that make these claims allowable over the prior art.

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Regarding claim 15, none of the prior art of record teaches or suggests the combination of an apparatus for alignment, wherein the apparatus comprising a detector for detecting a topology of at least one layer to determine an apparent location of a metrology mark, wherein the apparent location of the metrology mark being offset from the actual position of the metrology mark by a distortion amount; and a mask which is aligned according to the apparent location and adjustment information, wherein the adjustment information is corresponds to the distortion amount. It is these limitations as they are claimed in the combination, which have not been found, taught or suggested in the prior art of record, that make these claims allowable over the prior art.

Other Prior Art

12. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

Ye et al. (USP 5,798,947) disclose a null-overlay electrical measurements provide an objective indication of the actual alignment of the two layers, while measurements of the relationship of the reference indicia made using the imaging instrument include a systematic tool-induced error or shift (TIS) and wafer-induced shift (WIS).

Cresswell et al. (USP 5,617,340) disclose methods, apparatus and computer program products for self-calibrating two-dimensional metrology stages.

Horne (USP 3,657,545) discloses a method and apparatus for reproducing a pattern from one planar element upon another planar element

Contact Information

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13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to John H. Le whose telephone number is (703) 605-4361. The examiner can normally be reached on 9:00 - 5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John E. Barlow can be reached on (703) 308-3126. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

John H. Le

Patent Examiner-Group 2863

October 2, 2003

BRYAN BUI
PRIMARY EXAMINER

